



AFRL-AFOSR-VA-TR-2016-0267

IDENTIFYING DECEPTIVE SPEECH ACROSS CULTURES

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**07/27/2016
Final Report**

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REPORT DOCUMENTATION PAGE				<i>Form Approved</i> OMB No. 0704-0188	
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1. REPORT DATE (DD-MM-YYYY) 25-06-2016		2. REPORT TYPE Final Report		3. DATES COVERED (From - To) 15-09-2011 to 14-05-2016	
4. TITLE AND SUBTITLE IDENTIFYING DECEPTIVE SPEECH ACROSS CULTURES				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER FA9550-11-1-0120	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S) Hirschberg, Julia Bell				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) TRUSTEES OF COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK SPONSORED PROJECTS ADMINISTRATION				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) USAF, AFRL DUNS 143574726 AF OFFICE OF SCIENTIFIC RESEARCH 875 NORTH RANDOLPH STREET, RM 3112 ARLINGTON VA 22203				10. SPONSOR/MONITOR'S ACRONYM(S) AFOSR/PKR3	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT DISTRIBUTION A: Distribution approved for public release.					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT We have completed our collection of deceptive and non-deceptive speech recorded from interviews between native speaker of Mandarin and of English instructed to answer truthfully or to lie about 24 biographical questions. Subjects were rewarded or penalized financially for their ability to lie (interviewee) or to distinguish truth from lie (interviewer); each subject acted both roles. At 125h (174 subjects), this is by far the largest cleanly recorded speech corpus of its kind. From this data, we find that ability to lie is significantly correlated with ability to detect deception. We also find significant correlations of deception ability with personality factors (extraversion, conscientiousness). Using acoustic-prosodic features, gender, ethnicity and personality information our machine learning experiments can classify truth vs. lie in our data with 65% accuracy; we expect better results when we include lexical features. Surprisingly, using only 3-4m of norming data collected from each subject before the truth/lie interviews, and including lexical and acoustic-prosodic features, together with gender, ethnicity and personality scores we are able to predict ability					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON Benjamin Knott
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Final Report: “IDENTIFYING DECEPTIVE SPEECH ACROSS CULTURES”

PI: Julia Hirschberg, 6/25/2016

We have completed our collection of deceptive and non-deceptive speech recorded from interviews between native speaker of Mandarin and of English and are currently completing the use of this data to produce classifiers that can automatically distinguish truth from lie using speech features, gender, ethnicity, and personality inventory information.

Experimental Design: Subjects were brought into the lab, given a demographic survey to assess age, ethnicity, and years of English study. They were then asked to answer 24 biographical questions (e.g. “What is your mother’s occupation?”, “Who was the last person you were in a physical fight with?”) truthfully. We then chose 12 of these questions and asked them to prepare a false answer, which we checked to make sure this was different enough from the truth. Subjects were then interviewed individually in a sound booth to obtain “norming” speech data, pre-interview. We also administered the NEO-FFI Five Factor Personality inventory to each. Subjects then entered the booth again, where they took turns interviewing one another about the biographical questionnaire. They were separated in the booth by a curtain. Interviewers were asked to judge truth of lie for each of the 24 questions, also writing down their confidence in their judgment. Interviewees were asked to indicate for each statement they made in the interview whether that statement contained any false information or not by pressing a key on the keyboard in front of them. Subjects were rewarded or penalized financially for their ability to lie (interviewee) or to distinguish truth from lie (interviewer). At 125h (174 subjects), this is by far the largest cleanly recorded speech corpus of its kind.

Statistical Correlations and Classification Results: From analyzing the speech data we have collected, we find that ability to lie is significantly correlated with ability to detect deception ($r(280) = 0.12$, $p = 0.05$); this holds across all subjects but is strongest for females ($r(140) = 0.24$, $p = 0.005$). We also find significant correlations of deception ability with personality factors (e.g. extraversion is negatively correlated for English males, $r(70) = -0.24$, $p = 0.04$ and there is a tendency for conscientiousness also to be negatively correlated for English females while extraversion tends to be positively correlated for Mandarin females).

Using acoustic-prosodic features (e.g. pitch, intensity, speaking rate, voice quality), gender, ethnicity and personality information, our machine learning experiments can classify truth vs. lie in our data with 65% accuracy; we expect even better results when we include lexical features. Surprisingly, using only 3-4m of norming data collected from each subject before the truth/lie interviews, and including lexical and acoustic-prosodic features, together with gender, ethnicity and personality scores we are able to predict ability to detect deception with 65% accuracy over a majority class baseline of 59.9%.

We have also found significant differences in interviewers' ability to judge truth vs. lie depending upon whether the questions asked were yes/no (e.g. “Have you ever been in trouble with the police?” vs. open-ended (e.g. “What is the last movie you saw that you really hated?”)

or were sensitive (e.g. “Who ended your last romantic relationship?”) vs. non-sensitive (e.g. “Do you own an e-reader of any kind?”), with yes/no questions and sensitive questions easier for interviewers to judge correctly. Finally, we have also found that the 3-4m of norming data we collected even before the interviews began can be used to identify gender, ethnicity, and personality factors – as well as ability to deceive -- with considerable accuracy. We have also found important differences relating to gender and ethnicity, of interviewer and interviewee, with respect to ability to deceive successfully and with respect to the type of questions interviewers find easier to judge correctly.

1.

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Primary Contact Phone Number**Contact phone number if there is a problem with the report**

212-939-7114

Organization / Institution name

Columbia University

Grant/Contract Title**The full title of the funded effort.**

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Grant/Contract Number**AFOSR assigned control number. It must begin with "FA9550" or "F49620" or "FA2386".**

FA9550-11-1-0120

Principal Investigator Name**The full name of the principal investigator on the grant or contract.**

Julia Hirschberg

Program Manager**The AFOSR Program Manager currently assigned to the award**

Benjamin A. Knott

Reporting Period Start Date

09/15/2011

Reporting Period End Date

05/14/2016

Abstract

We have completed our collection of deceptive and non-deceptive speech recorded from interviews between native speaker of Mandarin and of English instructed to answer truthfully or to lie about 24 biographical questions. Subjects were rewarded or penalized financially for their ability to lie (interviewee) or to distinguish truth from lie (interviewer); each subject acted both roles. At 125h (174 subjects), this is by far the largest cleanly recorded speech corpus of its kind. From analyzing this data, we find that ability to lie is significantly correlated with ability to detect deception. We also find significant correlations of deception ability with personality factors (extraversion, conscientiousness). Using acoustic-prosodic features, gender, ethnicity and personality information, our machine learning experiments can classify truth vs. lie in our data with 65% accuracy; we expect even better results when we include lexical features. Surprisingly, using only 3-4m of norming data collected from each subject before the truth/lie interviews, and including lexical and acoustic-prosodic features, together with gender, ethnicity and personality scores we are able to predict ability to detect deception with 65% accuracy. We have also found significant differences in interviewers' ability to judge truth vs. lie depending upon whether the questions asked were yes/no vs. open-ended or were sensitive vs. non-sensitive, with yes/no questions and sensitive questions easier for interviewers to judge correctly. We have also found that this norming data can be used to identify gender, ethnicity, and personality factors with considerable accuracy. Overall, we have also found important differences relating

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to gender and ethnicity, of interviewer and interviewee, with respect to ability to deceive successfully and with respect to the type of questions interviewers find easier to judge correctly.

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Archival Publications (published) during reporting period:

2015. S. I. Levitan, M. Levine, J. Hirschberg, N. Cestero, G. Ahn, A. Rosenberg, "Individual Differences in Deception and Deception Detection," Cognitive 2015. (Best Paper Award)

2015. S. I. Levitan, G. An, M. Wang, G. Mendels, J. Hirschberg, M. Levine, A. Rosenberg, "Cross-Cultural Production and Detection of Deception from Speech," ACM Workshop on Multimodal Deception Detection, ICMI 2015.

2016. S. I. Levitan, Y. Levitan, G. An, M. Levine, R. Levitan, A. Rosenberg, J. Hirschberg, "Identifying Individual Differences in Gender, Ethnicity, and Personality from Dialogue for Deception Detection" NAACL Workshop on Computational Approaches to Deception Detection, NAACL 2016.

2016. S. I. Levitan, G. An, M. Ma, A. Rosenberg, R. Levitan and J. Hirschberg, "Combining Acoustic-Prosodic, Lexical, and Phonotactic Features for Automatic Deception Detection," Interspeech 2016.

2016. G. An, S. I. Levitan, R. Levitan, A. Rosenberg, M. Levine, J. Hirschberg, "Automatically Classifying Self-Rated Personality Scores from Speech," Interspeech 2016.

2. New discoveries, inventions, or patent disclosures:

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No

Please describe and include any notable dates

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Original PM: Joseph Lyons

Extensions granted or milestones slipped, if any:

NA

AFOSR LRIR Number

LRIR Title

Reporting Period

Laboratory Task Manager

Program Officer

Research Objectives

Technical Summary

Funding Summary by Cost Category (by FY, \$K)

	Starting FY	FY+1	FY+2
Salary			
Equipment/Facilities			
Supplies			
Total			

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Appendix Documents

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